CORED WIRE FOR INTRODUCING ADDITIVES INTO A MOLTEN METAL BATH

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a cored wire for introducing additives into a molten metal bath.

2. Description of Related Art

[Steels, irons, etc.,] Steel and iron are materials whose mechanical or other properties particularly depend on the complex composition of the material.

In order to obtain a material having certain properties resulting from a basic composition, the content of certain elements is adjusted to obtain the desired composition.

It has been known for about twenty years to adjust the composition of molten material by introducing a cored wire of predetermined length into it. This cored wire [is constituted by]includes a wire core surrounded by a metallic casing containing the additive that one wishes to introduce into the molten bath. The quantity of additive per meter being known, it is relatively simple to adjust the composition of the bath.

[In the] The first cored wires [produced] were manufactured with the metallic casing simply folded so as to place the two edges of the formed [strip] casing in a side by side configuration. An inner sheet was first put in place in order to close the gap that remained between the edges of [said strip] the casing, [but] however, this was not very effective given that [this] the cored wire was subjected to a winding operation on a reel, [then] followed by an unwinding operation during its utilization.

This solution was quickly replaced by a different closure for the [strip] casing, wherein [This method consists of mechanically crimping] the two edges of the casing are mechanically crimped. More precisely, [it consists of rolling] the two edges are rolled together so that the edges are fastened to one another. This prevents losses of the additive contained in [said] the casing [strip]. This solution, which makes it possible to adjust a composition by introducing a cored wire into the molten material, works very well with most additives.

However, problems arise with certain additives such as calcium, magnesium, selenium, sulfur and others. In essence, for some of these additives, the heat of the

molten metal bath causes the cored wire to explode in an area very close to the surface of the bath.

Other additives vaporize very quickly and close to the surface. This produces a strong surface reactivity, which results in an oxidation and/or renitriding of the bath, splashes of the liquid metal that damage the material, and heavy smoke emanation. [With these additives]Therefore, this introduction operation is [therefore] much less efficient in the presence of these additives, and the resulting safety conditions are not adapted for industrial utilization.

In an attempt to eliminate this problem, it is known to introduce the cored wire through a tube made of refractory material immersed in the bath. The use of this tube is very difficult and very costly.

The object of the invention is to eliminate the aforementioned drawbacks.

It is known to cover this metallic sheath with a wrapping which, being combustible without leaving any harmful residues, momentarily retards the propagation of heat to the core of the cored wire. [The advantages are interesting] This combustible wrapping is wound in a helix around the metallic sheath. Unfortunately, the paper wrapping is sometimes observed to deteriorate during handling, i.e., when [it] the wire is wound around the reel or when the wire placed on the reel is unwound in order to be introduced into the bath.

SUMMARY OF THE INVENTION

[For this reason,] The subject of the invention is a cored wire comprising a metallic sheath containing an additive [this sheath being characterized in that this metallic sheath is] and covered by a wrapping 7 which, being combustible without leaving any harmful residues, momentarily retards the propagation of heat to the core of the cored wire.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood with the help of the following description given as a non-limiting example, in reference to the attached drawing, which schematically represents:

- Fig. 1: a cross-section of a cored wire according to the invention,
- Fig. 2: a step in the preparation of the cored wire,

- Fig. 3: an installation using a cored wire,
- Fig. 4: a cross-section of a variant of a cored wire.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to [the drawings] FIGS. 1 and 3, we see a cored wire 1 designed for the introduction of an additive into a bath 2 of molten material, such as [a] steel, [an] iron, or another material according to the present invention. This molten bath is at a relatively high temperature, and is contained in a ladle 3.

In order to adjust the composition of the bath of molten material[, this] cored wire 1 is introduced into the bath at a predetermined speed. The means of introduction 4 are conventional and will not be described in detail.

[Conventionally, this]Cored wire [comprises] 1 includes a conventional metallic sheath 5 containing an additive formed around wire core 6. [This] Metallic sheath 5 is closed mechanically, which means that the edges of [the strip] sheath 5 are attached to one another, for example by rolling.

Advantageously, [this] metallic sheath 5 is covered by a wrapping 7 which, being combustible without leaving any harmful residues, momentarily retards the propagation of heat to the core of the cored wire. Harmful residues would include residues that affect the composition of the bath or produce inclusions that modify the behavior of the bath during casting.

[Advantageously] Referring to FIG. 2, the protective wrapping 7 is advantageously constituted by at least one layer 7A of paper rolled around the metallic sheath. [The] Paper 7A is a paper [for so called] used in pyrotechnic applications. This means that it is flame-resistant and has a thermal resistance coefficient higher than that of a sheet of ordinary paper. This thermal protection is obtained:

- either by integrating the flame-retardant constituents into the composition of [the]paper 7A,
- or by combining the paper layer and the adhesive used to attach the superposed strips to one another.

For example, there are known uncoated, wood-free, guaranteed flame-retardant M1 papers. This requires a material whose the flame propagation is nil, with no falling of burning drops and no flame persistence. [This] Such a wrapping has thermal insulation properties while being combustible.

Tests performed with one type of paper showed that:

- without a paper layer, the cored wire explodes after one second,
- with two layers, the cored wire explodes after one-and-a-half seconds, and
- with ten layers, the cored wire explodes after two-and-two-tenths seconds.

Thus, by adjusting the thickness of the wrapping and the speed at which the cored wire 1 is introduced, it is possible to sufficiently retard either the explosion or the vaporization, and it is then easy to introduce the cored wire to a sufficient depth.

The layer or layers of the wrapping 7 are advantageously constituted by one or more helical windings of a strip of paper. These windings are, for example, crossed.

In a variant [of] embodiment, an external fixation of these layers is achieved by applying a layer of varnish, which must [clearly] be completely free from water or any substances that react violently with the material constituting the bath. Therefore, a fixative layer is provided for the wrapping, especially when the latter is formed by several strips.

The width of the strip is preferably adapted to the diameter of the wire 6 and to the conditions for utilization, and is, for example, between five and forty centimeters. The thickness of the protective wrapping 7 is therefore adapted to the user's needs (temperature of the bath and material to be injected).

Advantageously (Fig. 4), particularly in certain cases where the injection machine 4 could damage the combustible wrapping 7, [on top of this combustible wrapping 7,]a protective metallic casing 10 [encloses] disposed on top of combustible wrapping 7 encloses the assembly constituted by the additive, the metallic sheath 5 and the combustible wrapping 7.

[Said] The entire assembly is therefore covered by a protective metallic casing 10, which [This protective metallic casing10] prevents the combustible wrapping 7 from being altered during the handling of the cored wire and thus forms, with the metallic sheath housing the additive and the combustible wrapping, a complex material that retards the melting of the assembly.

Advantageously, this protective metallic casing is constituted by a strip whose edges are crimped to form a tubular element[.] which is [This is] the method normally used to form the metallic sheath housing the additives. The shape of the crimp 11 is not illustrated. This [is the] method [that seems to be simplest] is simple to implement and [that] does not damage the combustible wrapping.

[Advantageously] In a separate embodiment, advantageously, instead of applying the paper sheet in wound form, the paper sheet can be much thicker and can be applied at the same time as the protective metallic casing. In this arrangement, [T]the edges of the thick sheet overlap.